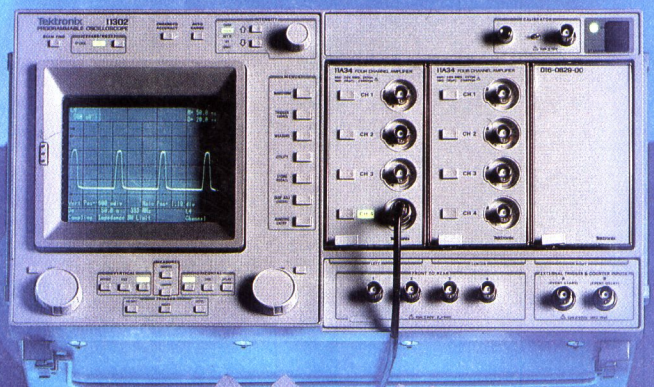
THE TEK 11300 SERIES:

THE BIRTH OF A NEW ERA IN ANALOG OSCILLOSCOPES.

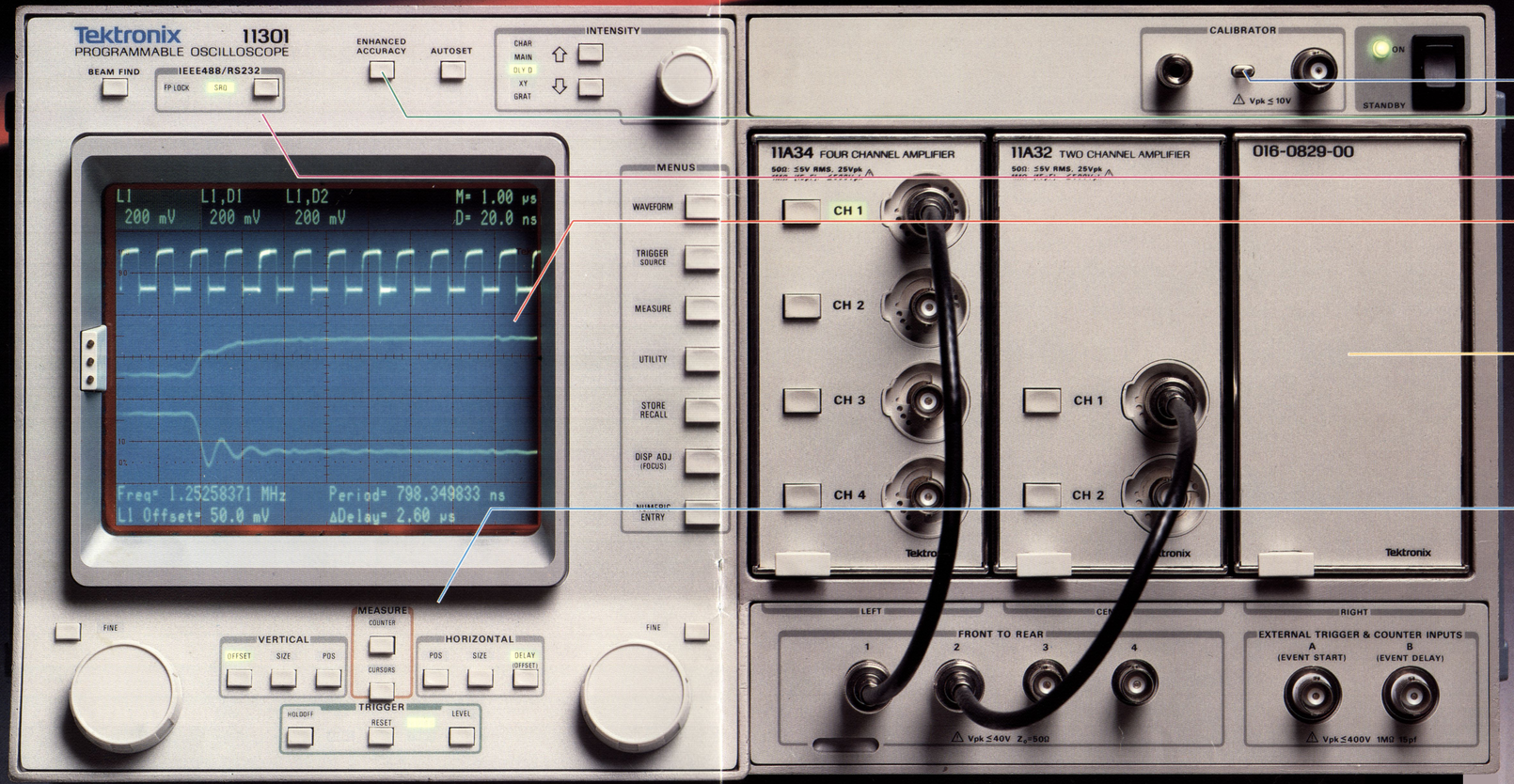


Tektronix®
COMMITTED TO EXCELLENCE

NEW GENERATION ANALOG

OSCILLOSCOPES THAT REDEFINE THE STANDARDS OF MEASUREMENT CAPABILITY...

...AND OPERATING SIMPLICITY.



Counter view trace lets you see what the counter sees when using the integrated counter/timer. No more uncertainty about where the measurement is made.

Built-in calibrator with selectable amplitudes and frequencies.

Push the Enhanced Accuracy button to calibrate the scope from amplifier input to CRT graticule, automatically.

Full programmability via IEEE-488 or RS-232C.

Dual delayed sweeps for precise visual comparison of two events and for accurate propagation delay measurements.

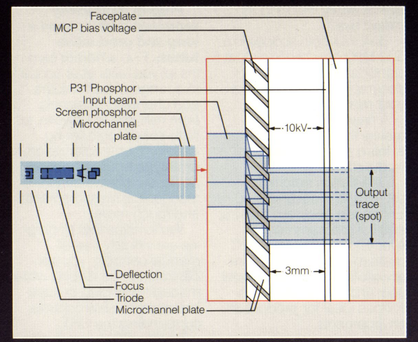
Touch screen operation presents you only with those controls relevant to the task at hand.

Display up to eight traces at once.

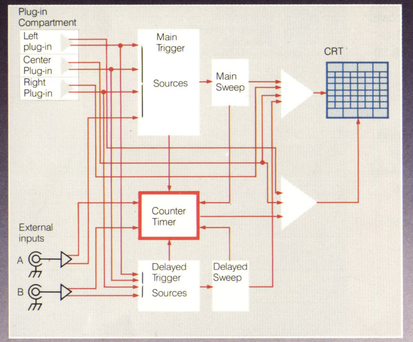
Plug-in modularity assures excellent versatility and promises a long, useful future. Five new amplifier plug-ins are immediately available.

Use the cursors to make precise measurements on any part of a displayed waveform. Results can be automatically displayed in decibels, percent, degrees, volts or seconds.

Push buttons assign vertical, horizontal and triggering controls to the two knobs. Cursors are also push-button selectable.



The 11302's microchannel plate is a thousand times brighter than conventional CRTs. Its fast writing rate brings to light the random events, metastable pulses and fast, low rep-rate signals ordinarily invisible to the eye.



500 MHz Universal Counter-timer capability is integral to the 11300 Series architecture, providing 6 measurement functions and a degree of resolution and accuracy previously unobtainable in an analog scope.

At first glance, you see that the new Tek 11300 Series is a radical evolution of analog oscilloscopes.

You see the largest, easiest to read CRT of its kind.

You see more information on-screen at once—up to eight traces and eight measurement readouts—than on any other scope in its class.

You see an all-new user interface that has cleared the front panel of most knobs and buttons in favor of a touch screen that lets you save steps and keep your eyes on the display.

Take a closer look, you'll begin to see the true performance breakthroughs of these 500 MHz and 400 MHz instruments:

An ultra-fast 10 div/ns visual writing rate on the microchannel plate 11302. An integrated universal counter timer whose accuracy and resolution is alone worth the price of the scope. Amplifier plug-ins with unparalleled overdrive recovery among many one-of-a-kind capabilities.

When you're ready for a first-person look at the new era in oscilloscopes, your Tek representative is ready with a personal demo—and with the proof that nothing else can touch it.

AS YOU NEED IT

SCOPES THAT CAN CHANGE WITH THE TASK. AND THE TIMES.

The 11301 and 11302 are fully programmable, highly modular, 8-channel instruments, designed as the foundation for years of future growth.

The 11301 offers 400 MHz bandwidth; the 11302, 500 MHz bandwidth plus Tek's proprietary microchannel plate CRT with ultra-fast, 10 div/ns visual writing rate. The microchannel plate is ideal for troubleshooting and debugging tasks, because it makes even the fastest single shot transients and other once-hidden events easily visible to the naked eye.

Built into both scopes is a 500 MHz counter/timer that significantly extends the accuracy and resolution of your measurements.

A new user interface makes the 11301/302 faster to learn and a pleasure to work with.

One-button automatic set-up and measurement, Enhanced Accuracy feature, and full programmability over IEEE-488 or RS-232C make measurements more accessible to the occasional user and make the oscilloscopes ideal for production environments.

Plug-in modularity promises both scopes a long and productive future. Five amplifier plug-ins let you tailor your scope to a range of bandwidths and channels, to signals from millivolts to kilovolts, to high-speed logic timing, waveform characterization, prototype troubleshooting, power supply evaluation, mechanical measurements and much more.

You'll notice that all plug-ins are virtually free of manual controls: you concentrate on the display while managing all plug-in capabilities via the few controls surrounding the CRT.

Resident firmware is also modular, so Tek can keep the 11301 and 11302 current with new technologies and new capabilities. Modularity means, too, that the scopes are easily and quickly serviced: one reason why the first on-site oscilloscope maintenance program can be part of your 11300 Series package.

By any measure, the new generation 11300 Series is an outstanding value in high-performance oscilloscopes. Its affordability will surprise you. Its designed-in longevity, labor-savings, and new powers of measurement will forever change your expectations of a scope.

FINGERTIP SIMPLICITY

A NEW APPROACH TO OPERATION THAT YOU CAN PICK UP IN MINUTES.

The 11300 Series was designed to let the operators make the decisions, while the scopes do the setups, the measurements and the computation required.

You don't have to know about their architecture or operational theory to apply them.

Push one button—Autoset—to capture and display an automatically scaled and triggered signal.

Push a second button and touch the screen to automatically measure up to eight common waveform parameters on a single trace. Basic measurements have never been easier.

Call up the cursors to precisely measure any part of a displayed waveform, with results scaled and displayed in the units of measurement you want.

New probes and probe interface are designed to let the probe communicate its type, serial number, attenuation ratio, offset scale factors and units of measure. A user-definable button at the probe tip can be used to initiate automatic measurements, recall settings, generate interrupts to the external interface, or create and autoset traces with a single touch.

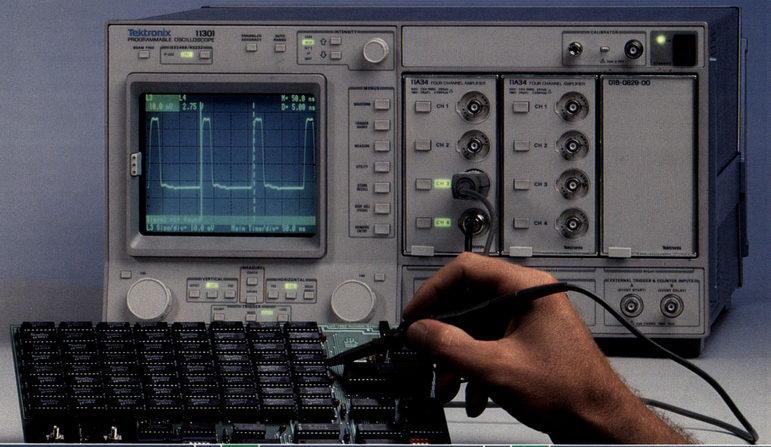
Use the touch screen numeric keypad to enter precise scope settings like offset, sweep delays and reference values.

To end confusion, the human interface narrows your choice of functions to those appropriate to the present task. For example, the same two knobs used to control the cursors one moment can control vertical sensitivity, sweep rate, trace position, triggering level or other adjustments the next, using either fine or coarse knob sensitivity. A third knob is used to control trace intensities and graticule illumination.

New probes let you control functions from a button on the probe tip, so your hands need never leave the circuit. You can also use the probe button to initiate new measurements or to sequence through a series of stored setups.

Or, call up all functions over the IEEE-488 or RS-232C interface.

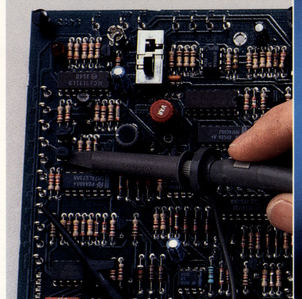
Any way you look at it—from the clarity of its new, larger screen size to the documentation convenience of its continual time-and-date display—the 11300 Series makes more information easier to come by than in any other high-performance analog scope.



The series of ongoing demonstrations across the bottom of this brochure is color-keyed to these examples:

- Automatic Measurement
- Delayed Sweep
- Cursor Measurements
- Microchannel Plate/ Digital Camera System
- Using the Universal Counter/Timer
- Special features and menus

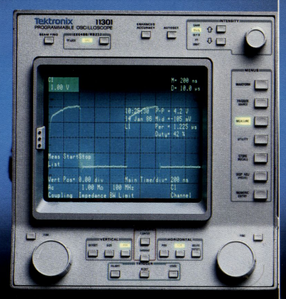
Automatic Measurement. For most common measurements, operation is as fast and easy as attaching the probe…



…touching the ID button on the probe or the autoset button on the front of the scope, to automatically range the oscilloscope horizontally and vertically and to set up the trigger level…

…and pushing a major menu button to the right of the CRT, which then allows you to select the waveform parameters you want measured.

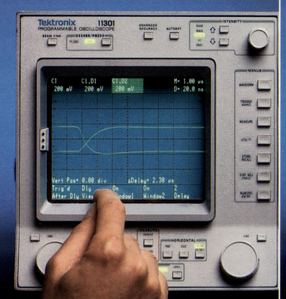
Up to eight waveform parameters can be measured and displayed automatically, or sent to a controller via the IEEE-488 or RS-232C buses. This makes the 11300 Series ideal in systems environments.



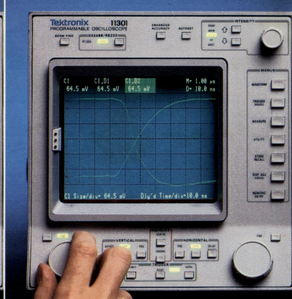
Dual Delayed Sweep. Dual delayed sweeps allow expansion of the main sweep for close examination and accurate measurement of waveform parameters such as risetime and falltime. Pushing the Delay button and touching the CRT displays the first delayed sweep.

Touch the CRT again to display a second independently positioned delayed sweep.

With one more touch of the CRT menu, you can display only the delayed sweeps.



Use the two knobs below the CRT to adjust vertical and horizontal size and sweep rate to full screen display.



EXACTING ACCURACY

BUILT-IN COUNTER/TIMER IS AT THE HEART OF THE HIGHEST LEVELS OF PRECISION.

By integrating a 500 MHz universal counter/timer into the 11300 architecture, Tek has achieved the best accuracy and resolution ever at these bandwidths in an analog oscilloscope.

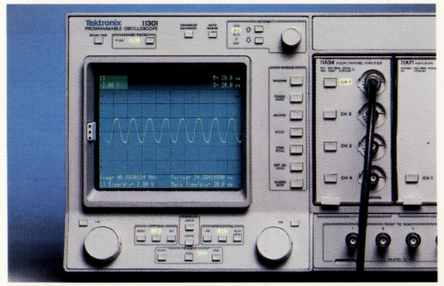
Frequency, width, period, totalize, ratio and time A to B measurements can all be made to 7-digit resolution. Up to 10-digit resolution is obtainable with an external reference or an optional high-stability timebase. Timing resolution is 2 ns single shot and up to 10 ps with averaging.

By combining a high-performance counter/timer with a high-performance oscilloscope, Tek simplifies the most difficult counter/timer measurements while adding capabilities never previously possible with a counter/timer alone. Yet this synergy of two powerful instruments is priced as one.

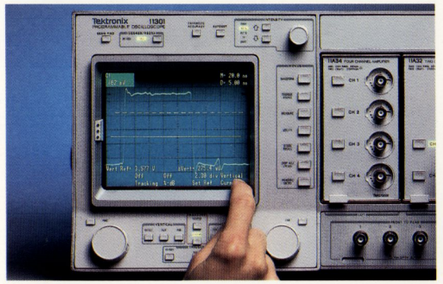
A one-of-a-kind counter view trace feature lets you see exactly what portions of a signal you are triggering on. Because you see what the counter sees, you can be certain that you are measuring exactly what you want. No other counter/timer or oscilloscope offers this kind of confidence.

Use this counter/timer in conjunction with the scopes' dual delayed sweep capability to make precise timing measurements between any selected points on a waveform.

An Enhanced Accuracy command automatically calibrates the scope from amplifier inputs to the CRT graticule. This patented capability can be invoked at the touch of a button whenever a critical measurement is ahead, or whenever the scope warns that it is out of calibration. Using its own ultra-stable DC source as a reference, the scope calibrates its accuracy to ±(1% + .04 div.) using cursors. Maximum absolute DC accuracy is even better.



By using an external reference or the scope's optional high-stability counter/timer clock, up to 10-digit resolution is possible with averaging when using the counter timer.



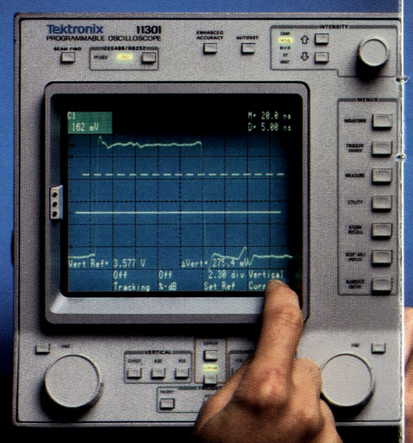
Results of horizontal and vertical cursor measurements are displayed numerically on the screen, in appropriate units of measure, including percent, decibels, and degrees.

Push the Enhanced Accuracy button to calibrate the scope from the amplifier inputs to the CRT.

Another CRT selection lets you invoke cursors for horizontal measurements.

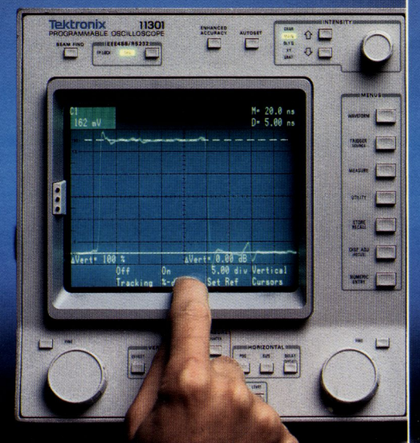
Measure risetime by positioning the cursors at the 10% and 90% points. The risetime measurement is automatically displayed at the bottom of the screen.

Cursors (measuring aberrations). Accurate measurements are easily made by invoking cursors. One touch below the CRT brings up the cursor prompt in the lower right corner of the screen. Touch the screen to bring up the vertical cursors.

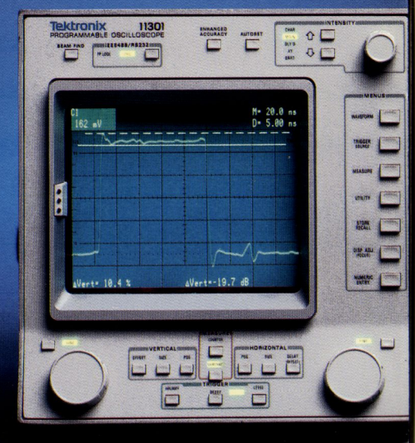


Position the cursors using the two knobs. Knob assignment is made automatically. Cursors can then be independently positioned at the top and bottom of the waveform.

When the cursors are positioned, the operator selects the measurements to be read out in %, then touches the Set Ref prompt to store the pulse amplitude as the cursor reference value (0%).



To measure the pulse aberrations as a percentage of pulse amplitude, the operator then positions the cursors at the min. and max. excursions of the aberrations. Results are displayed at the bottom of the screen.



ALL THE ANSWERS

PROVIDING THE FULL SCOPE OF PERFORMANCE, FROM BENCH TO PRODUCTION FLOOR.

For prototype trouble-shooting and debugging: the microchannel plate 11302.

For the first time, designers can get simple, visual answers to the hard questions arising from complex or high-speed circuits. Here are a few of the things designers can do with the 11302:

View fast pulses. Previously invisible glitches are easily viewed even in daylight with the 10 div/ns single shot writing rate of 11302's microchannel plate CRT.

Draw on ultimate precision. Up to 2 ns single-shot resolution with the integral counter/timer. Up to ±(1% + .04 div.) vertical accuracy with cursors.

A 500 MHz transient digitizing oscilloscope. Attach Tek's new Digitizing Camera System to acquire transient signals for instant display, signal processing and hard copy output via any IBM or IBM-compatible PC.

Make differential measurements. The 11A33 plug-in offers extremely fast overdrive recovery, high CMRR and ±8 volts of offset comparison voltage at 1 mV sensitivity.

You can measure small signals with large DC offsets without sacrificing the low frequency components often lost with AC coupling.

Display YT and XY signals at the same time. View up to 8 traces. Add or subtract signals from separate plug-ins and view XY displays simultaneously for new insights into measurements.

For manufacturing test and engineering evaluation: the 11301. Features especially useful to production environments include:

Built-in 500 MHz Counter Timer to assure a more complete set of measurements at a greater level of accuracy.

Rackmount configuration. Within 15 minutes, the 11300 Series is ready to put in a rack. Use the optional 8 front-to-rear BNC patch cables for rack mounting.

Full programmability. Both IEEE-488 and RS-232C interfaces are standard. The scopes are designed to Tek Codes and Formats for easy, consistent integration.

Automeasure. Up to 8 waveform parameters are automatically measured and made available over the IEEE-488 or RS232C bus.

Autoset. At the push of a button on the front panel or probe, users obtain a scaled and triggered signal display.

Template waveforms. Like an "electronic grease pencil" the scope displays waveform limits for clear visual comparison.

Operator prompts. Messages can be down loaded and displayed on the CRT to prompt the operator as necessary.

On-site service to minimize downtime.

Tek reliability and reconfigurability. Count on the 11300 Series to endure punishment, continual operation, and your changing needs. It is an oscilloscope series designed to stay current far beyond the applications you purchase it for.

Rackmount configurations are supported by the scope's feed-through BNC connectors, permitting cabling from the rear or access to sweep, gate and vertical signal output.

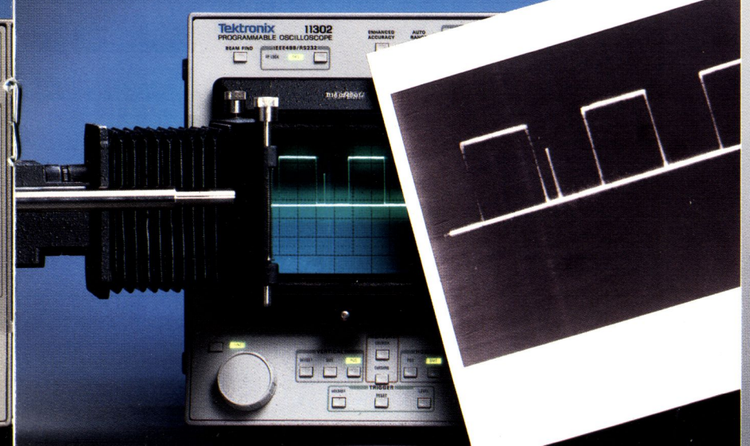
With the Tek Digital Camera System and the 11302, you can capture and transmit to your PC repetitive and transient signals at the full bandwidth of the oscilloscope.

Microchannel Plate/ Digitizing Camera. The 500 MHz 11302 contains a microchannel plate to enhance the writing rate of the CRT.

As a result, the 11302 is ideal for engineers and technicians debugging new prototypes or troubleshooting existing designs. Problems and aberrations invisible in other scopes can be clearly displayed.

Using the 11302, you can find very fast pulses that exist among much slower pulses caused by race conditions in digital logic, as shown below. Metastable conditions, where an output occasionally assumes an erroneous state, can be easily displayed and examined.

Attach the Tek Digitizing Camera System to the 11302 to create a 500 MHz transient digitizing oscilloscope. At the push of a button, a hardcopy of the digitized waveform can be displayed, or the data sent to a PC for analysis.



THE 11000 GENERATION

ANALOG AND DIGITIZING OSCILLOSCOPES ALL WITH TEK'S MODULAR TOUCH.

Only Tektronix could introduce a new era in oscilloscopes on the scale of the 11000 Series.

Whether your applications are best served by analog or digitizing measurement, the 11000 Series offers users the same simplified operation; open, modular architecture; high reliability in the Tek tradition; and the most responsive support ever developed for oscilloscopes.

New Analog versions include the fully programmable 400 MHz 11301 and the 500 MHz Microchannel Plate 11302, both with built-in 500 MHz Universal Counter/Timer. Both provide unsurpassed vertical and horizontal accuracy and resolution.

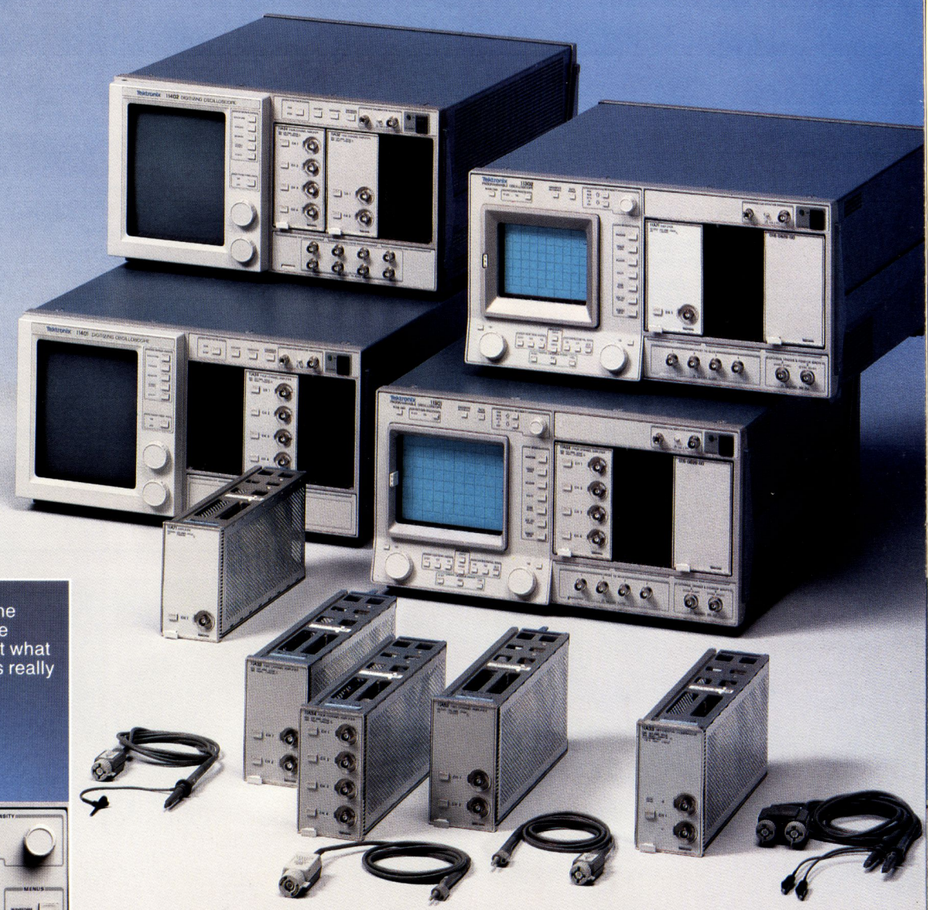
New digitizing versions include the 500 MHz 11401 and 1 GHz 11402. Both are fully programmable instruments whose integral dual timebases, 10 ps horizontal resolution and 10-bit vertical resolution—up to 14-bit with averaging—put new powers of analysis at your fingertips.

Along with the new scopes and their plug-ins comes a new family of probes and probe interface. The interface provides power to support any active probe (up to eight) through the connector, making extra cables or supplies unnecessary. It also allows each probe to communicate its type, serial number, attenuation ratio, offset scale factors and units of measure automatically.

The first on-site service for oscilloscopes is available through the 11000 Series Warranty-Plus option. Preventive maintenance, performance verification and fast troubleshooting can now all be performed on-site, making back-up instruments unnecessary and helping scope owners better manage throughput and capital equipment costs.

You can expect Tek to demonstrate the same commitment to the 11000 Series that has kept the 7000 Series the vanguard of oscilloscope technology for nearly 15 years. New models, plug-ins, firmware and system support are planned for continual development, consistent with Tek's reputation for updating, not outdating its instruments.

For more information, including videotape preview and hands-on demonstration, contact your local Tektronix sales representative.

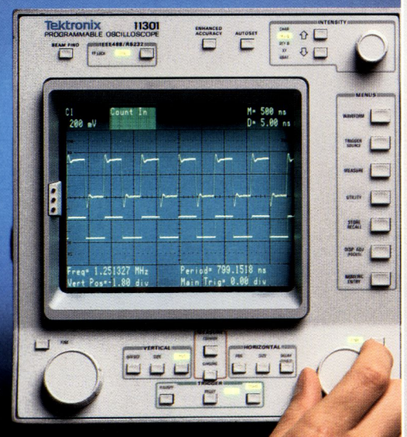


Counter/Timer. The 11300 Series' integrated 500 MHz universal counter/timer is invoked by touching a button below the CRT, then touching the CRT itself to scroll through the desired functions. Here, a frequency measurement is selected.

A unique counter view feature lets you see exactly what the counter/timer is triggering on. A selection in the Waveform menu displays the counter Schmitt trigger just below the waveform of interest.

Here, the counter-trigger display makes it apparent that the counter is double-triggering due to overshoot on the waveform.

Adjusting the trigger level displays a counter view trace that ignores the ringing and counts only the frequency of the pulse. No more worrying about what your counter is really counting!



SPECIFICATIONS

TEK 11301/11302
ANALOG OSCILLOSCOPES

SPECIFICATIONS 11301/11302

Vertical System

System Bandwidth: Determined by mainframe and plug-in; see plug-in bandwidth matrix.

Accuracy: Determined by accuracy state of mainframe; see plug-in descriptions.

Delta Delay between channels: Adjustable ±500 picoseconds.

Vertical System Delay: At least 20 nanoseconds of the sweep is displayed ahead of the triggering event.

Horizontal System

Main Sweep Timing Range: 5 ns/div to 0.5 s/div in 1-2-5 steps, plus 1% increments between steps and to 1.5 s/div. X10 MAG extends maximum sweep rate to 0.5 ns/div.

Delayed Sweep Timing Range: 5 ns/div to 0.2 s/div, plus 1% increments between steps and to 0.6 s/div. X10 MAG extends maximum sweep rate to 0.5 ns/div.

Main & Delayed Sweep Accuracy (Time/div in a 1-2-5 step): ± 0.7% of time interval plus 0.06 div.

Delta-Time Accuracy Using Cursors: ± (0.5% of time interval plus 0.03 div.)

Delta-Time Accuracy Using Delayed Sweep: ± (0.3% of time interval plus 0.01 div.)

X-Y Operation: From center plug-in: Bandwidth—Dc to 3 Mhz; Phase Difference between X and Y with normal bandwidth—1 degree or less from dc to 1 MHz, 3 degrees or less from 1 MHz to 2 MHz.

Triggering

Minimum p-p signal required for stable triggering (from left, center, or right plug-in for main sweep; for left or center plug-in for delayed sweep):

Dc Coupled:
0.35 div from dc to 50 MHz; increasing to 1.0 div at 500 MHz.

Ac Coupled:
0.35 div from 50 Hz to 50 MHz, increasing to 1.0 div at 500 MHz.

HF REJECT Coupled:
0.5 div from dc to 30 kHz.

LF REJECT Coupled:
0.5 div from 80 kHz to 50 MHz, increasing to 1.0 div at 500 MHz.

Triggering sensitivity can be adjusted to reject unwanted noise components on noisy signals.

Minimum p-p signal required for stable triggering from A and B external inputs:

Dc Coupled:
20 mV from dc to 50 MHz, increasing to 60 mV at 500 MHz.

Ac Coupled:
20 mV from 50 Hz to 50 MHz, increasing to 60 mV at 500 MHz.

HF REJECT Coupled:
28 mV from dc to 30 kHz.

LF REJECT Coupled:
28 mV from 80 kHz to 50 MHz, increasing to 80 mV at 500 MHz.

Triggering sensitivity can be adjusted to reject unwanted noise components on noisy signals.

Holdoff-By-Time Range: To 15 seconds.

Holdoff-By-Time Resolution: The larger of 2 ns or 0.01 times the time/div setting.

Holdoff-By-Events Range: 1 to 5×10^8

Max Event Frequency: At least 300 MHz

BANDWIDTH/RISETIME MATRIX

	11302	11301
11A71 Single-Channel 10 mV/div, 50 ohm	500 MHz/ 700 ps	400 MHz/ 875 ps
11A52 Dual-Channel 1 mV/div, 50 ohm	400 MHz/ 875 ps	350 MHz/ 1 ns
11A32 Dual-Channel 1 mV/div, 1M ohm/50 ohm	350 MHz/ 1 ns	300 MHz/ 1.2 ns
11A34 Four-Channel 1 mV/div, 1M ohm/50 ohm	250 MHz/ 1.4 ns	250 MHz/ 1.4 ns
11A33 Differential Comparator, 1 mV/div, 50Ω, 1 M/1G ohm	150 MHz/ 2.4 ns	150 MHz/ 2.4 ns

BUILT-IN COUNTER/TIMER

Modes: Frequency, Period, Width, Ratio A/B, Time A→B, Totalize

Number of digits: Up to 10 (system computes and displays proper number of valid digits for specific measurement).

Averaging: Selectable in two-decade steps (1, 10^2, 10^4, 10^6, etc.) up to 10^{10} for frequency, period, width, ratio, and time A→B measurements. Auto Averages provides maximum resolution achievable with a 3-readings-per-second update rate.

Gating: Via External B input or internal delayed sweep gate. Minimum external gate width: less than 50 ns.

Counter View: Shaped one-division p-p display of any one or more of the following signals: Counter In, Sync Gate, Gate, A External Input, B External Input. Counter view traces are among the maximum eight displayed traces.

Sensitivity: (via external counter inputs): < 100 mV p-p dc to 300 MHz, < 500 mV p-p 300 MHz to 500 MHz; via internal trigger inputs: same as sweep triggering sensitivities.

COUNTER REF CLOCK In/Out: Connector on rear panel allows application of 0 dbm, 1 MHz or 10 MHz external clock.

FREQUENCY

Range: < 1 mHz to > 500 MHz

LSD: Greater of $\frac{\pm 2\text{ns} \times F^2}{N}$ rounded to the next higher decimal digit, or 1 count.

Resolution: Greater of LSD ± $\frac{1.4 \times TJE \times F^2}{N}$ or 1 count.

Accuracy: Resolution ± (F × TBE)

PERIOD

Range: Without Averaging, 2 ns to > 1000 s.

LSD: $\pm \frac{2\text{ ns}}{N}$ rounded to next higher decimal digit.

Resolution: LSD ± $\frac{1.4 \times TJE}{N \times \sqrt{G}}$

Accuracy: Resolution Error ± TBE × P.

RATIO

Range: 10^{-11} to 10^{11}

Frequency Range: 0.1 Hz to > 500 MHz

LSD: $\frac{\text{Freq A}}{\text{Freq B} \times N}$ rounded to the next decimal digit where N refers to A events.

Resolution: LSD ± $\frac{1.4 \times TJE \times \text{Freq A}}{N}$ where N refers to A events.

TOTALIZE

Range: 0 to 10^{12} counts (scientific notation used above 10 digits).

Resolution: ± 1 count (up to 10^{10} digits).

WIDTH

Range: Without Averaging, 2 ns to > 1000 s.

Maximum Repetition Rate: > 200 MHz.

LSD: $\frac{2\text{ ns}}{\sqrt{N}}$

Resolution: ± LSD ± leading edge TJE ± trailing edge TJE.

Accuracy: Resolution ± [Width × TBE ± Hysteresis Error ± TLE × input slew rate at the start and end points ± 2 ns systematic error]

TIME INTERVAL

Range: Without Averaging, 2 ns to 100 s.

Maximum Repetition Rate: 100 MHz.

LSD: $\frac{2\text{ ns}}{\sqrt{N}}$

Accuracy: ± (LSD + 100 ps + TBE * result + $1.4 \times \frac{TJE}{\sqrt{N}}$ + 0.001% × Main time base size/div.) × $\sqrt{N}$.

DEFINITION OF TERMS

TJE = Trigger Jitter Error

F = Frequency

TBE = Time Base Error

G = Number of gate intervals in one measurement

P = Period

TLE = Trigger Level Error

N = Number of events in measurement interval

STANDARD TIMEBASE

Frequency at Calibration: 10 MHz ± 1 Hz

Temperature Stability: ± 50 Hz, 0°C to 50°C (5 ppm).

Aging: < 10 Hz/yr (1 ppm)

Adjustment Resolution: 0.5 Hz

HIGH-STABILITY TIMEBASE (OPTION 1T)

Frequency at Calibration: 10 MHz ± 0.2 Hz

Temperature Stability: ± 2 Hz, 0°C to 50°C

Warm-up Time: 10 minutes at 25°C to within 0.2 ppm of final frequency.

Aging: $< 1 \times 10^{-8}$/day at time of shipping. $< 4 \times 10^{-8}$/week after 30 days continuous operation. $< 1 \times 10^{-6}$/year after 60 days continuous operation.

Short-term stability: $< 1 \times 10^{-9}$ RMS based on 60 consecutive 1 s measurements.

Adjustment Resolution: 0.2 Hz

Adjustment Range: Sufficient for 8 years of aging.

EXTERNAL CONNECTORS

Camera Power: 3-pin connector next to crt compatible with Tektronix C-50 series cameras

CALIBRATOR Output: Front-panel female BNC connector. Squarewave mode: 5.0 V or 500 mV square wave (into open circuit); 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz; 450-ohm output impedance. Fast rise mode: 0.5 V into open circuit, 2-ns transition time into 50 ohms; 50-ohm output impedance; same frequencies as Squarewave mode.

A & B EXTERNAL TRIGGER AND COUNTER INPUTS: Front-panel female BNC connectors. Input impedance: 1MΩ

TRIGGER READY Output: Rear-panel female BNC connector. Low state, 0 to 0.5 V; high state, +2.4 to 5.0 V.

TRIGGER RESET Input: Rear-panel female BNC connector. Input TTL compatible.

SWEEP GATE Output: Rear-panel female BNC connector.
Low state: 0 to 0.5 V.
High State: 2.7 to 5.0 V.

COUNTER REF CLOCK In/Out: Rear-panel female BNC connector. See Counter/Timer description.

MAIN SWEEP Output: Rear-panel female BNC connector. Positive-going ramp, 0 V to 5 V, coincident with main sweep; output impedance 950 ohms.

Z-AXIS Input: Rear-panel female BNC connector. Positive voltage decreases intensity; +2V blanks a maximum intensity trace.

LEFT VERTICAL OUT: Rear-panel female BNC connector. Output signal amplitude is 100 mV/div of displayed trace; bandwidth, dc to 100 MHz.

Display

11301: 8 × 10 divisions (1.22 cm/div) P31 phosphor

11302: 8 × 10 divisions (1.0 cm/div) P31 phosphor

11302 Writing Rate: 10-div/ns single-shot visual writing rate in 20-footcandle ambient illumination.

Physical Specifications

	11301	11302
Weight	18.1 kg (40 lbs)	20.0 kg (44 lbs)
Shipping Weight	21.8 kg (48 lbs)	23.6 kg (52 lbs)
Bench model:		
Height (with feet)	239 mm (9.4 in)	
Width (with handle)	447 mm (17.6 in)	
Depth (overall)	581 mm (22.9 in)	
Rackmount model:		
Height	222 mm (8.75 in)	
Width	482 mm (19.0 in)	
Depth (from mounting face)	548 mm (21.6 in)	

Environmental Specifications

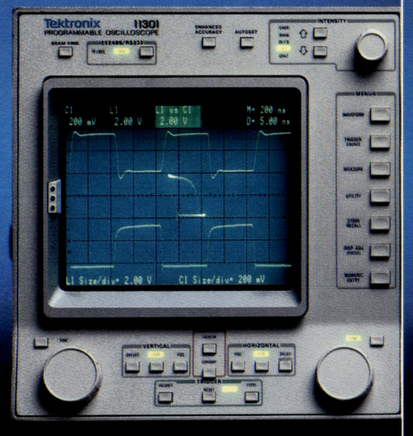
Temperature:	
Operating	0 to +50 deg. C
Nonoperating	−55 to +75 deg. C
Humidity:	
Operating and Nonoperating	Up to 95% relative humidity, at up to 50 deg. C

Meets Mil-1-28800C Type III Class 5 for the following: Altitude, vibration, shock, and bench handling.

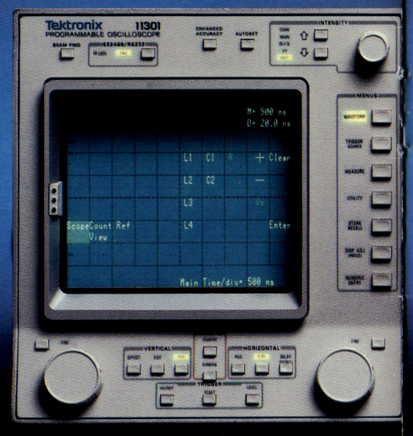
Electromagnetic compatibility: Meets following requirements:
MIL-T-28800C
MIL-STD-461B
FCC Part 15, subpart J, Class B
VDE 0871/6.78 Class B

Up to six counter functions can be invoked by touching the CRT. Frequency, width, period, totalize, time A→B and ratio measurements can all be made with confidence by using the counter view feature of the 11301 and 11302.

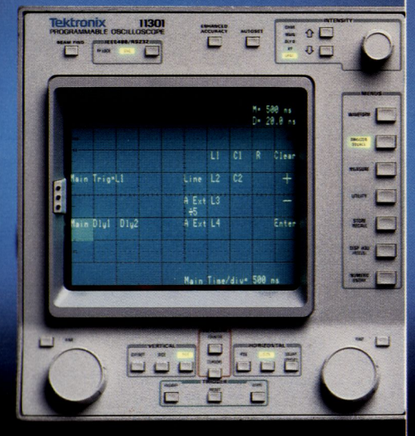
XY/YT display. X-Y and Y-T traces can be displayed at the same time. The intensity for each can be adjusted separately.



Major menus. The Waveform menu allows waveforms to be added or subtracted and X-Y traces to be created. It allows the counter view feature to be invoked, so you can see exactly what you are triggering on. Use the menu, too, to display reference waveforms for making comparisons against a standard.



The Trigger Source menu assigns the trigger to the proper input channel or to the external inputs. Main and delayed sweeps can be independently triggered.



The Utility menu allows the calibrator frequency and amplitude to be adjusted, the probes to be easily calibrated, the time and date to be displayed on the CRT, and provides many other useful housekeeping functions.

The Numeric Entry menu allows reference values to be quickly entered or simple calculations to be conveniently made.

SPECIFICATIONS

TEK 11301/11302
ANALOG OSCILLOSCOPES

CE-01 Part 4, with exceptions
CE-03 Part 4, Curve 1
CE-03 Part 4, Curve 4, Navy, NB, BB (with exceptions)
CS-01 Part 7
CS-02 Part 4 (with exceptions)
CS-06 Part 5
RE-01 Part 4 (with exceptions)
RE-02 Part 4
RS-01 Part 4
RS-03 Part 7 (limited to 1 GHz)

Safety

Listed or Recognized Component, Electrical and Electronic Measuring and Testing Equipment UL 1244

Category Certified "Electronic Development Test Equipment," CSA Bulletin 556B dated September 1973.

Self-certified by Tektronix to comply with appropriate IEC 348 recommendation.

Options

Option 1C, Cable feedthroughs
Adds four additional rear-to-front feedthroughs to the existing standard four; total eight.

Option 1R, Rackmount
Includes hardware and instructions for converting bench model of 11301 and 11302 to rackmount configuration.

Option 1T, High-stability clock for counter/timer

Option S0, On-site installation
Installation and verification of proper operation at customer site.

Option S1, On-site Service
Warranty upgrade; includes full warranty coverage at customer site including at least one visit for product verification.

Included Accessories

Operator's Introduction Manual
User's Reference Guide
User's Pocket Reference

Optional Accessories

Three volume service manual
2-Meter GPIB Cable
10-foot RS-232 Cable
Blank Panel for filling empty plug-in compartments

11000-SERIES PLUG-INS

Single Trace, Dual Trace, Four Trace, Differential
Up to 500 MHz Bandwidth
Up to 1-mV/div Deflection Factor
Calibrated Offset with Fast Overdrive Recovery
Switchable Input Impedances

Overdrive Recovery
Switchable Input Impedances

Five different amplifier plug-in units are available with Tektronix 11000-series oscilloscopes, providing up to 500-MHz bandwidth in the 11302 analog mainframe. The accompanying matrix shows the bandwidth and risetime of each of the amplifier plug-in units in each of the mainframes.

Virtually all control of the 11000 plug-ins is accomplished through the mainframe controls, either manually or over the IEEE-488 or RS-232C bus. The only control on the amplifier plug-ins is a single pushbutton for each channel. This button is used only to turn the display of the associated channel on and off; it has no effect on the availability of the input signal to the triggering or auxiliary channels of the mainframe.

Each of the input channels on all amplifier plug-ins uses the new TEKPROBE interface. This interface allows the mainframe to supply power to active probes, to sense the type (and, with some probes, the serial number) of the probe, to supply offset voltage to probes so equipped, to detect activation of the probe's ID pushbutton, and to provide other communication between probe and mainframe as appropriate to the type of probe. A serial data line in the TEKPROBE interface provides the means for a high level of communication with present and future special purpose probes.

A sixth plug-in under development will expand the triggering capability of 11000-series far beyond that available in any current oscilloscope. This unit will operate in the right-hand plug-in compartment of any of the 11000-series mainframes and will provide the means of triggering on a wide range of intermittent signal anomalies present in any of up to eight signals. This will permit the user to examine circuit conditions which exist only during aberrant circuit behavior unobscured by "normal" signals. The specialized triggering plug-in will also permit timed combinational triggering on up to eight applied signals, preconditioned by plug-in amplifiers within the same mainframe.

11A71

Dc to 500 MHz Bandwidth (in 11302)
Calibrated Deflection Factors from 10mV/div to 1V/div
50Ω Input Impedance

The 11A71 plug-in is the highest bandwidth amplifier currently available for the 11000-Series mainframes. It provides 500-MHz bandwidth in the 11302 analog mainframe. Input impedance is 50 ohms only.

DC Offset is used to position the trace in units of 0.25 divisions (coarse) and 0.025 division (fine). Total offset range is 10 divisions at all sensitivities.

The 50Ω input is automatically disconnected when an input signal exceeds approximately 5VRMS. Manual reset.

Characteristics

Bandwidth—Maximum determined by the mainframe. See Bandwidth/Risetime matrix.

Calibrated Deflection Factors—Coarse steps from 10 mV/div to 1 V/div in 1-2-5 sequence. Fine steps are not available.

△V DC Accuracy*—With 11301/11302: ±(.9% + 0.05 div)
*Accuracy of on-screen △V measurements with POSITION control set to zero.

DC Balance— ±0.2 div

Input Coupling Modes—AC, OFF, and DC.

Input Impedance—50 ohm ±2% VSWR: < 1.45:1 dc to 1 GHz.

AC Coupling LF–3dB Point—1 KHz maximum when driven from 50Ω.

Typical Noise (RMS)—0.007 divisions.

Maximum Input Voltage—5 VRMS, 25 Vpeak. AC Coupled: 100Vdc additional.

Ordering Information

Option 26—Includes P6231 Probe

11A52

Dc to 400 MHz Bandwidth (in 11302)
Dual Trace
Calibrated Deflection Factors from 1 mV/div to 10 V/div
50-ohm Input Impedance
High Resolution Calibrated DC Offset
Fast Overdrive Recovery

The 11A52 plug-in is a high speed dual-trace plug-in with 50 ohm input impedance. The VSWR, bandwidth, noise and overdrive recovery are superior to the 11A32, but no 1 MegΩ input impedance is available. Both coarse and fine deflection factor steps are fully calibrated. Two four pole (24 dB/octave) bandwidth limit filters (100 MHz and 20 MHz) are available per channel to reduce unwanted high frequency noise. Bandwidth at 1 mV/div is approximately 250 MHz.

The high resolution DC Offset is set in units of 0.25 divisions (coarse) and 0.025 division (fine). At 1 mV/division, this results in a resolution of 25 μV and a range of ±1.0 volts (equivalent to 16 bits).

The 50Ω input is automatically disconnected when an input signal exceeds approximately 5 VRMS. Manual reset.

Characteristics

Bandwidth—Maximum determined by the mainframe. See Bandwidth/Risetime matrix.

Calibrated Deflection Factors—Coarse steps from 1 mV/div to 10 V/div in 1-2-5 sequence. Fine steps are settable in increments of 1% of the next more sensitive coarse deflection factor. See table below.

△V DC Accuracy—With 11301/11302: ±(1.0% + 0.04 div.)

DC Balance, 1 mV/div to 99.5 mV/div—With 11301/11302: ±(0.2 mV + 0.13 div).

Offset Accuracy, 1mV/div to 99.5 mV/div (+ 1.0 V range)— ±(0.15% + 0.4 mV)

Note: For the absolute dc accuracy of single point measurements using OFFSET, add the Offset Accuracy and DC Balance terms.

11000-SERIES BANDWIDTH/CALCULATED RISETIME MATRIX

	11302	11301
11A71 Single-Channel 10 mV/div, 50 ohm	500 MHz/ 700 ps	400 MHz/ 875 ps
11A52 Dual-Channel 1 mV/div, 50 ohm	400 MHz/ 875 ps	350 MHz/ 1 ns
11A32 Dual-Channel 1 mV/div, 1M ohm/50 ohm	350 MHz/ 1 ns	300 MHz/ 1.2 ns
11A34 Four-Channel 1 mV/div, 1M ohm/50 ohm	250 MHz/ 1.4 ns	250 MHz/ 1.4 ns
11A33 Differential Comparator, 1 mV/div, 1 M ohm/1G ohm	150 MHz/ 2.4 ns	150 MHz/ 2.4 ns

OTHER 11A52 CHARACTERISTICS

Coarse Deflection Factor Range	Offset Range	Typical Noise divisions RMS	Overdrive Recovery in 20ns to	Overdrive Recovery for Vin
1.0 mV→1.99 mV	±1.0 V	0.08	0.1% + 0.2 div	<2.0 V
2.0 mV→4.98 mV	±1.0 V	0.04	0.1% + 0.2 div	<2.0 V
5.0 mV→9.95 mV	±1.0 V	0.02	0.1% + 0.2 div	<2.0 V
10.0 mV→99.5 mV	±1.0 V	0.012	0.1% + 0.2 div	<2.0 V
100 mV→995 mV	±10.0 V	0.012	0.1% + 0.2 div	<20 V
1.0 mV→10.0 mV	±100 V	0.012	0.1% + 0.2 div	<200 V

Input Impedance—50Ω ±0.5% VSWR: < 1.25:1 dc to 500 MHz.

Input Coupling Modes—AC, OFF, and DC.

AC Coupling LF –3dB Point—1 KHz maximum when driven from 50Ω.

Maximum Input Voltage—5 VRMS, 25 Vpeak. AC Coupled: 40Vdc additional.

Ordering Information

Option 25—Includes two P6231 probes

11A32/11A34

Dc to 350 MHz Bandwidth (11A32 in 11302)
Dual Trace (11A32) or Four Trace (11A34)
Calibrated Deflection Factors from 1 mV/div to 10 V/div
50Ω or 1 MegΩ Input Impedance
High Resolution Calibrated Dc Offset
Fast Overdrive Recovery

The 11A32 (two channel) and 11A34 (four channel) plug-ins are virtually identical except for the number of channels. Both coarse and fine deflection factor steps are fully calibrated. Two four pole (24 dB/octave) bandwidth limit filters (100 MHz and 20 MHz) are available per channel to reduce unwanted high frequency noise for each channel. Bandwidth at 1 mV/div is approximately 250 MHz.

The high resolution DC Offset is set in units of 0.25 divisions (coarse) and 0.025 divisions (fine). At 1 mV/division, this results in a resolution of 25 μV and a range of ±1.0 volts (equivalent to 16 bits).

The 50Ω input is automatically disconnected when an input signal exceeds safe levels. Manual reset.

Input Impedance—50Ω or 1 MegΩ in parallel with 15 pF.

AC Coupling LF–3dB Point—10 Hz maximum.

Maximum Input Voltage (1 MegΩ mode)—500 V (dc + peak Ac), derate 20 dB/decade above 1 MHz.

Maximum Input Voltage (50Ω mode)—5 VRMS, 25 Vpeak.

Ordering Information

11A32 Option 22—Includes two P6234 probes.
11A34 Option 23—Includes four P6134 probes.

11A33

Dc to 150 MHz Bandwidth
1-mV/div to 10-V/div Calibrated Deflection Factors in 1% Increments
±8 Volts Calibrated Dc Offset High Common Mode Rejection Ratio
Selectable 1G-ohm Input Impedance

The 11A33 differential comparator amplifier plug-in unit provides exceptionally fast overdrive recovery and high common mode rejection of signals at considerably higher bandwidths than has been previously possible in any wide-bandwidth amplifier. Input impedance is switchable between 50 ohms, 1 Megohm, and 1G ohm. The 11A33's ±8 volts of calibrated dc offset at maximum sensitivity of 1 mV/div provides an effective screen height of 16000 divisions for very high resolution and high accuracy measurement of dc signal components.

OTHER 11A32 AND 11A34 CHARACTERISTICS

Coarse Deflection Factor Range	Offset Range	Typical Noise divisions RMS	Overdrive Recovery in 50ns to	Overdrive Recovery for Vin
1.0 mV→1.99 mV	±1.0 V	0.12	0.3% + 0.2 div	<2.0 V
2.0 mV→4.98 mV	±1.0 V	0.06	0.3% + 0.2 div	<2.0 V
5.0 mV→9.95 mV	±1.0 V	0.025	0.3% + 0.2 div	<2.0 V
10.0 mV→99.5 mV	±1.0 V	0.014	0.3% + 0.2 div	<2.0 V
100 mV→995 mV	±10.0 V	0.014	1.0%	<20 V
1.0 V→10.0 V	±100 V	0.014	1.0%	<200 V

Note: For the absolute dc accuracy of single point measurements using OFFSET, add the Offset Accuracy and DC Balance terms.

Input Coupling Modes—AC, OFF, and DC.

Characteristics

Bandwidth—DC to 150 MHz. (Switchable BW limit to 100 MHz or 20 MHz)

Deflection Factor—1 mV/div to 10 V/div in 1-2-5 sequence plus 1% increments between steps.

△ V DC Accuracy—With 11301/11302: ±(1.4% + 0.04 div.)

DC Balance, 1 mV/div to 99.5 mV/div—With 11301/11302: ±(0.5 mV + .13 div).

Vc Accuracy, 1mV/div to 99.5 mV/div (8 V range)— ±(0.15% + 0.6 mv).

Input Impedance—Switchable—1 Megohm/15 pF, 50 ohms, and 1 G ohm.

Offset Range—
1 mV/div to 99.5 mV/div: ±8 V
100 mV/div to 0.995 V/div: ±80 V
1 V/div to 10 V/div: ±500 V

Max input voltage—
1 mV/div to 50 mV/div:
40 V (dc + peak ac); derate 20 db per decade above 1 MHz.
100 mV/div to 0.5 V/div:
400 V (dc + peak ac); derate 20 db per decade above 1 MHz.
1 V/div to 10 V/div:
500 V (dc + peak ac); derate 20 db per decade above 1 MHz.

Displayed Noise—0.15 div rms or less at full bandwidth.

Common Mode Rejection Ratio—
1 mV/div to 99.5 mV/div:
10,000:1, dc to 1 MHz
1000:1 at 40 MHz
100 mV/div to 0.995 V/div:
1000:1, dc to 1 MHz
100: 1 at 40 MHz
1 V/div to 5 V/div:
500:1, dc to 1 MHz
100:1 at 40 MHz

Overdrive recovery:
Within 0.2% within 30 nanoseconds

ORDERING INFORMATION

Option 24—Includes one P6135 probe.

For further information, contact:

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